The Institute Spokesman

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*Centralized Lubrication**

By A. J. Jennings
The Farval Corp., Cleveland, Ohio

This paper traces the history of centralized lubrication and describes some of the systems and devices in current use. Detailed descriptions of some types of application and the economies to be expected from them are given, including presses and forging machines, machine tools, rolling mills, and rubber mills.

* * * * *

Introduction

The problem of frictional losses has been given a great deal of consideration in the design of modern machinery by the design engineer, the machinery builder, the bearing manufacturer, the lubricating system manufacturer, the lubricant supplier, and the lubrication engineer. All have combined their knowledge and experience with the result that the old time waste is being avoided, costs have been lowered and productive output increased.

We all recognize that continued operation of mechanical equipment depends upon its bearings, and that bearings in turn will operate only so long as they receive proper lubrication at regular intervals. It is doubtful, however, if all of us fully appreciate the difference between the kind of a job you get when all lubrication is turned over to a centralized system, as compared to leaving it in the hands of the human element.

In the first place, many plants in the past have had a crew of old timers on whom they could depend and who would take a personal pride in their knowledge and ability to keep the equipment operating. Today most plants are fortunate if they can retain one or two of their key men and therefore, they must rely for the most part on new and inexperienced crews who often have neither the knowledge nor the inclination to do a thorough job.

As a result of the tremendous expansion of plant equipment required to meet the productive demands of World War II, hundreds of our manufacturing plants have had a first hand experience with modern centralized lubricating equipment. They have had the experience of having new machines with centralized lubrication placed right along side of old equipment without it. They have also seen their old machines go down for lack of lubrication while the new units continue to turn out the products. This experience is being reflected in the increased demand on the machinery builder to provide a positive, dependable and complete system of centralized lubrication in his machines.

In a recent survey conducted by the magazine STEEL of the future markets for machine tool equipment, 85.6% of all users indicated they wanted centralized lubrication on their new tools, and in plants employing 500 people or more, the vote for centralized lubrication was nearly 94%.

History

No discussion of centralized lubrication in the post-war period would be complete without touching on the history of lubricating methods in general and on the developments of centralized lubricating systems in particular.

We are all familiar with the old grease cups and oil cups but the first really modern equipment for the application of lubricant was the pressure gun and nipple used on the motor car chassis around about 1917 to 1918.

In spite of the very obvious advantage and convenience of the pressure gun and fitting, it was not until about 1922 or 1923 that this improvement came into use in industrial plants. The savings in lubricant, cleanliness, and better lubrication from the high pressure flushing action in the bearing, along with the improved quality of lubricants generally, led to the widespread use of this equipment in practically all manufacturing plants.

However, with this method it soon became apparent that many machines had to be shut down in order to lubricate their bearings and very few machines can wait until the next shutdown for their lubricant. Also any attempt to lubricate while operating involved the risk of injury to the oiler.

The next step in the development of this type of application, consisted of grouping the fittings or nipples at central stations accessible from the floor and running the individual tubes from each fitting to the bearing. Flexible hose connections were used to connect to moving points of application.

This arrangement was the first big step in the right direction and is illustrated in Figure 1.

You will note that the greaser or oiler could connect to some 70 or 80 nipples on this press and lubricate all bearings without having to climb all over the machine, or shut it down in order to lubricate.

* Courtesy Lubrication Engineering.

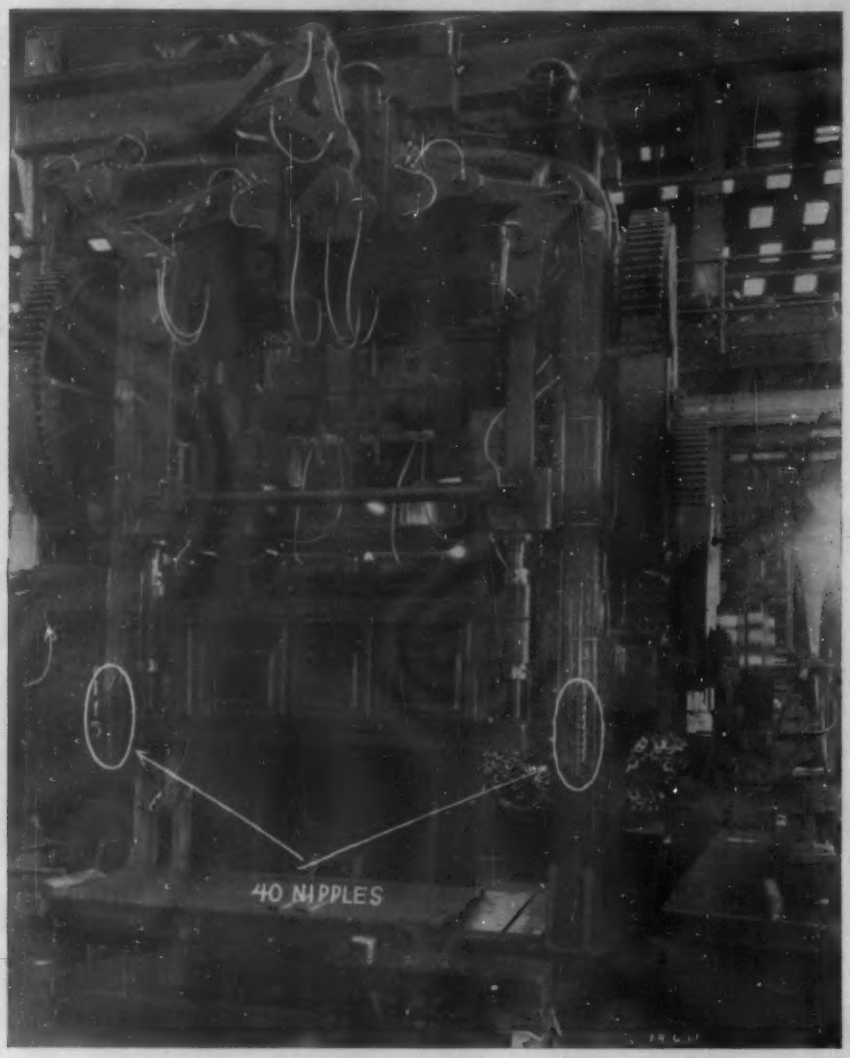

FIGURE 1

The oiler had to learn through experience, however, about how much lubricant to give each bearing.

Thus it was necessary to depend upon the human element with no accurate control over the quantity of grease delivered to each bearing.

The bearings were not visible to the oiler when making the gun connection to the several fittings so some bearings received too much, some too little and some were missed entirely. In other words, there was no measuring valve for each bearing.

Along about this time also a variety of automatic pressure feeding grease cups were introduced, and broadly speaking, all were designed to provide a constant delivery of grease as long as the bearings were in operation. To attempt a complete description of each of these devices would require a rather extensive explanation, which would be of very doubtful value. I will, therefore, comment on but one of the more successful devices of this type as illustrated in Figure 2.

The spring on top of the large piston in this grease cup provides a source of constant pressure on the supply of grease and the screw threads in the pin, which is closely fitted in the outlet bore, offer resistance to the flow of lubricant from the outlet. As lubricant is slowly discharged from the cup, the pressure on the spring gradually becomes less, but at the same time the screw threads of the resistance pin are gradually passing out of the restricted bore, thus reducing the amount of resistance to the flow of lubricant. By this means resistance is reduced proportionately to the lowered spring pressure and a controlled constant rate of delivery is provided.

The constant pressure supplied by the spring, combined with a restricted orifice at the outlet, caused many of the greases used to bleed or separate the soap and oil. When this occurred the cup would load up with a cake of hard soap preventing further delivery to the bearing.

Most of the pressure feeding grease cups, therefore, required the use of a special lubricant. Special grease was required to insure proper operation of the device, regardless of whether it was suitable for the bearing or not.

Many of these grease cups performed an outstanding job on a few special applications, but when they were tried for universal application the limitations were apparent. However, over a period of time these devices have gradually found their own level and are being used successfully for specific applications where they are best adapted. As a matter of fact, no single lubricating device or system is best for all types of lubricant and all types of machine equipment.

Mechanical oil lubricators, for example, as shown in Figure 3, have been in use for 30 years or more and for some applications they are still the most satisfactory devices on the market. In the past, many applications were made because there were no other types of mechanical lubricators available, but a considerable portion of this equipment today could be served better by a properly designed system of grease lubrication. Actually this type of device was originally designed for engine room lubrication rather than production machinery and it still fits engine room lubrication better than any other type of lubricator because it will handle oil only.

The high pressure gun and grease nipple as applied to the modern motor car have been the means of educating a great many people to the advantages resulting from the proper application of quality greases. They provide a quick, convenient method for delivery of clean grease to a bearing

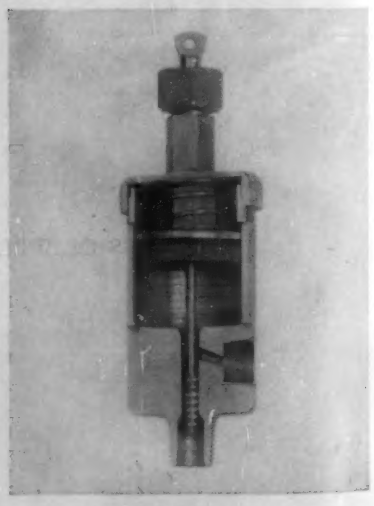

FIGURE 2

TENTATIVE PROGRAM

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14th Annual Convention

of the

NATIONAL LUBRICATING GREASE INSTITUTE

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SYDNEY BEVIN, Fiske Bros. Refining Co.
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MAIN BALLROOM

The Edgewater Beach Hotel

Chicago, Ill.

September 30th, October 1st and 2nd, 1946

★

Monday, September 30th, 1946

Registration — 8:30 — 10:00 A. M.

★

Morning Session

10:00 A. M. — 12:30 P. M.

ADDRESS OF WELCOME

CARL W. GEORGI, President, N.L.G.I.

Introduction of the New Executive Secretary
CARL E. BOLTE

"Automotive Greases from the Automotive Engineer's Viewpoint"—DR. W. S. JAMES, Ford Motor Co.

"Performance Testing of Bearing Greases"
R. C. ADAMS, Naval Experiment Station

Afternoon Session

2:00 — 4:30 P. M.

"Pressure-Viscosity Characteristics of Greases"
T. G. ROEHNER, Socony-Vacuum Oil Corp.

"Design of Anti-Friction Bearing Installations"
WALTER SAVELAND, Allis-Chalmers Mfg. Co.

"Electron-Microscope Studies of Lubricating Greases"
B. B. FARRINGTON, S. O. of California

"Rapid Method of Oil Extraction from Greases"
GLENN WILLIAMS, Battenfeld Grease & Oil Co.

Tuesday, October 1st, 1946

Morning Session

9:30 A. M. — 12:30 P. M.

"Improved Accessibility of Chassis Grease Fittings"

WALTER DUNCAN, Alemite Corp.

"Design of Anti-Friction Bearings to Prevent Over-filling and to Permit Periodic Flushing"

H. R. REYNOLDS, Chief Engineer, Fafnir Bearing Co.

RECESS

"Continuous Grease Manufacture"

H. G. HOULTON, Votator Div., The Girdler Corp.

"Aviation Grease Problems"

GILL BROWER, Pan American Airways, or representative from CAA.

Afternoon Session

2:00 — 4:00 P. M.

"Advantages of the Proper Care of Motor Car Lubricants"
DAYTON P. CLARK, Gulf Oil Corp.

"Lubrication Problems of the Future"
H. R. WOLF, General Motors Corp.

"Strontium Greases"
L. W. MCLENNAN, Research Dept., Union Oil of Calif.

Cocktail Hour

5:00 P. M.

_____ Room

Members and their guests, including ladies.

Annual Banquet
Tuesday Evening
7:00 P. M.

Members and their guests, including ladies.

★

Wednesday, October 2nd, 1946

Morning Session

9:30 A. M. — 12:30 P. M.

Technical Committee

Symposium on Pumpability of Grease and delivery characteristics of dispensing equipment. Prepared discussion by leading grease technologists and dispensing equipment engineers.

Afternoon Session

2:00 — 4:00 P. M.

Technical Committee

Open business meeting. Members and guests invited.

The INSTITUTE SPOKESMAN

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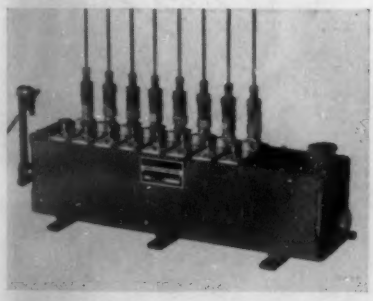

FIGURE 3

nder high pressure and at the same time lush out most of the old lubricant.

They do not, however, provide an accurate control over the amount of lubricant delivered and there is no assurance that the oiler will always connect the gun to every grease fitting. This task of control and dependence upon the human element led to the development of the centralized pressure system of grease lubrication.

As in the case of the grease gun and fitting, the early attempts at centralized systems were first made in the motor car chassis field and these systems were all of the so-called one-shot type. The earliest installation with which I am familiar is one that was put on a Hudson car in about 1922. Our original company made its first

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industrial installation in 1926 and, therefore, was one of the pioneers of this field.

Our modern, high speed, continuous production industries demand positive and regular lubrication with accurate control over the amount of lubricant required by all bearings. Any centralized system of lubrication, therefore, must provide for the positive delivery of a pre-determined quantity of lubricant to each bearing, regardless of the condition or location of the bearing, and this delivery must be made independently of all other bearings.

PISTON DISPLACEMENT PRINCIPLE

Without going into all of the many stages of development of the different systems, it is significant that every one of the successful grease systems now being offered, employs the piston displacement principle of measurement to control delivery of lubricant to each bearing.

The valve used to control the positive delivery of lubricant at the bearings is the most important single element in a centralized system of lubrication and, therefore, must be given first consideration in any discussion of a system for the proper application of industrial greases.

The piston displacement principle, which has had universal acceptance, obviously requires that a piston reciprocate in a cylinder to discharge a measured amount of lubricant with each operation.

The first positive piston displacement measuring valve was pressure operated in one direction, but spring operated in the other or on the return stroke.

Figure 4 depicts the heart of the first centralized system of 1926. Let's call it the Model "T" of centralized lubrication.

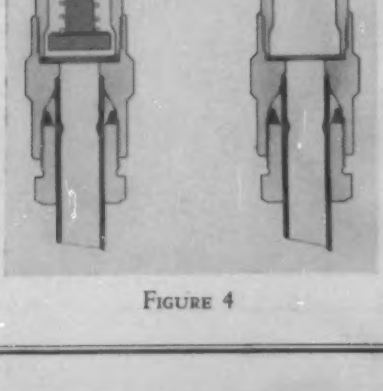

FIGURE 4

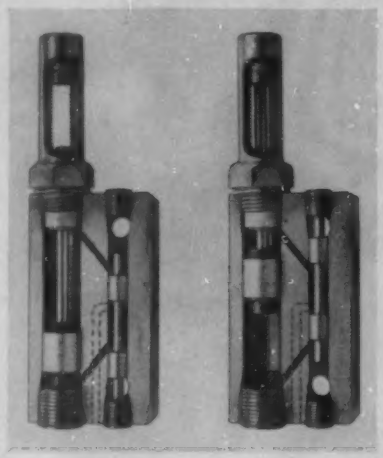

FIGURE 5

The limitation of this design is due to the fact that its successful operation depends upon a spring. This spring cannot return the piston to its original position until the pressure throughout the system has dropped low enough to permit the spring to overcome the static pressure remaining in the supply line. If the supply line extends beyond a rather limited distance, it becomes difficult and sometimes impossible to get proper relief of pressure throughout the length of the line. This is especially true with almost all greases excepting only the very light, soft grades. The spring controlled type of valve, therefore, is greatly restricted by being limited to the very soft greases only and, therefore, to bearings and machinery using this type of lubricant.

The spring actuated valve also operates to cause bleeding and separation of greases due to the pressing action of the piston on the return stroke, when it is working against the column of grease under static pressure in the supply line.

In general the use of springs and check valves constitutes an ever present hazard in any device employed for the application of industrial lubricants. Springs greatly restrict the selection of the proper grade and type of lubricant, and check valves are very susceptible to even small particles of dirt, foreign matter, or small lumps of soap base that might be contained in a grease.

HYDRAULIC MEASURING VALVE

From the above it is obvious that a fully hydraulic lubricant measuring valve is preferable, particularly when it means the entire elimination of any mechanical connections, springs, check valves, or restricted ports and passages.

One type of hydraulically operated grease valve is illustrated in Figure 5. You will note that this structure provides for the reciprocating movement of the valve piston, by alternating the application of pressure on the lubricant in each of the two main supply lines, to which all valves are connected.

When pressure is applied to the lubricant in the line connected to the upper inlet connection, lubricant is directed into the top side of the main bore containing the large piston. The incoming lubricant moves the main piston down, to discharge a measured quantity through the valve outlet. The incoming lubricant on this operation fills the main chamber above the large piston.

When the top line is relieved of pressure and active pressure is applied to the lubricant in the line connected to the lower inlet

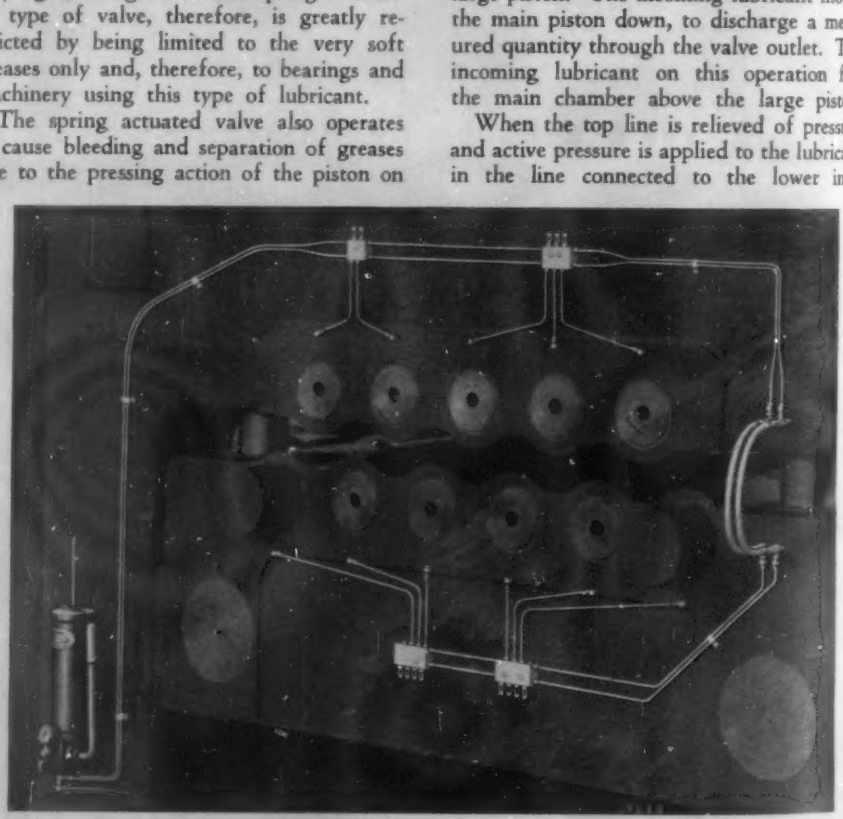

FIGURE 6

connection, lubricant is directed into the lower side of the main bore causing the large piston to move upward. Upward movement of this piston ejects a measured quantity of lubricant through the valve outlet and this delivery continues until the large piston reaches the end of its stroke. The incoming lubricant on this operation fills the main chamber below the large piston and this charge of lubricant will in turn be delivered to the bearings when pressure is again applied to the upper inlet connection, as previously described.

This Dualine valve is adjustable for quantity and carries its own telltale indicator. It contains no springs, no check valves, has but two moving parts and will successfully distribute any type of pumpable grease or oil.

THE COMPLETE SYSTEM

Figure 6 illustrates a typical complete system layout with the manually operated central pumping unit and the two parallel supply lines, to which all measuring valves are connected. The grease measuring valves are located adjacent to the bearings they are to serve, with the short outlet connections from each valve chamber to its bearing.

(To be continued)

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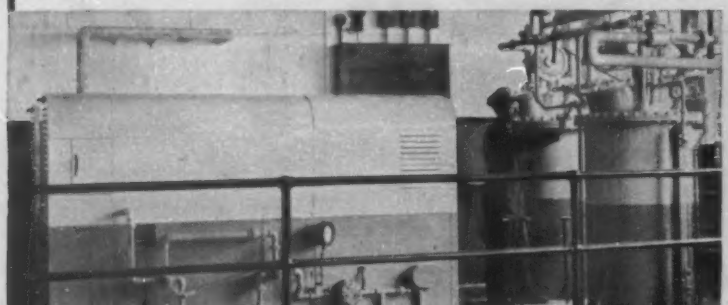

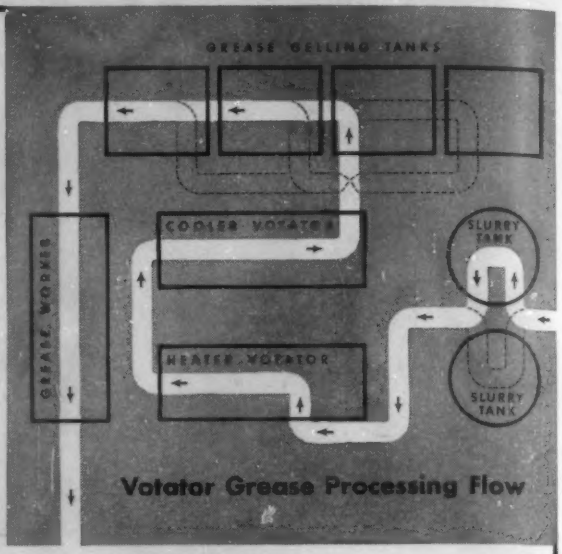

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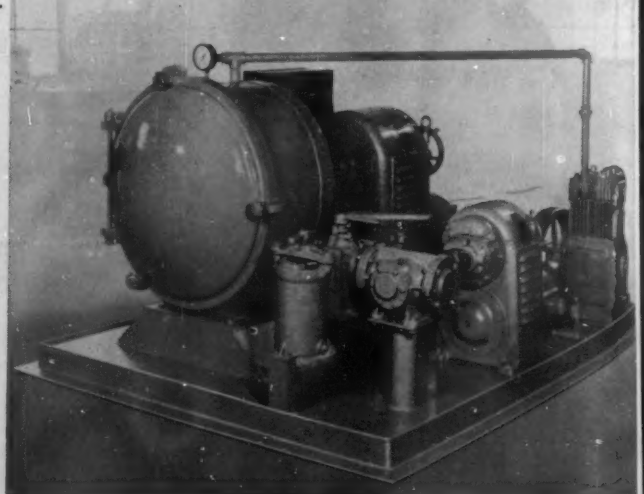

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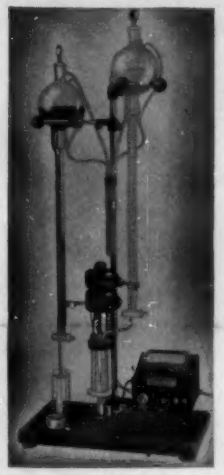

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